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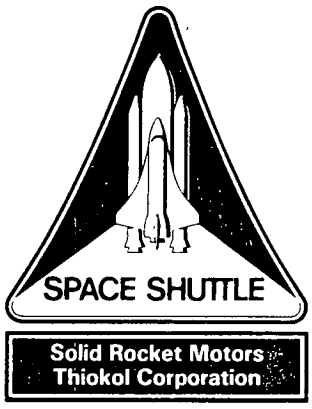


TWR-17270 VOL. VI

# QM-6 FINAL PERFORMANCE EVALUATION REPORT IGNITER

JULY 1990

**Prepared for:**

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**
**GEORGE C. MARSHALL SPACE FLIGHT CENTER**
**MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812**

| | |
|---|---|
| **Contract No.** | NAS8-30490 |
| **DR. No.** | 5-3 |
| **WBS.No.** | 4B102-10-06 |
| ECS. | 1002 |

*Thiokol CORPORATION*
*SPACE OPERATIONS*

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(NASA-CR-184001) QM-6 FINAL PERFORMANCE EVALUATION REPORT IGNITER, VOLUME 6 (Thiokol Corp.) 48 p CSCL 21H

N90-27779

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TWR-17270
QM-6 FINAL PERFORMANCE EVALUATION REPORT
IGNITER

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## 1.0 INTRODUCTION

The Space Shuttle Redesigned Solid Rocket Motor (RSRM) static test of Qualification Motor (QM-6) was conducted 20 April 1988 at Morton Thiokol, Inc., Space Operations. The QM-6 was a full scale, full duration test.

This report does not include all test results, but rather, addresses the performance of the igniter, safing and arming device, and their associated seals.

## 2.0 OBJECTIVES

The objective of this report is to document the post test condition of the Igniters and associated components, and to show QM-6 static test compliance with Specification CPW1-3600, Addendum D, dated 3 Aug 1987.

Qualification Objectives (CEI Paragraph)

G. Certify that all RSRM seals experience no erosion or blowby through the static test (3.2.1.2).

V. Verify that the ignition system seals, if pressurized, accommodate static test motor structural deflections (3.2.1.2.4.a).

W. Certify that the ignition system seals, if pressurized, operate at test temperature, 55° minimum (3.2.1.2.4.b).

X. Certify that the ignition system seal verification does not degrade the performance of integrity of the sealing system (3.2.1.2.4.c).

AR. Certify that the ignition system precludes hot gas leakage during and subsequent to motor ignition (3.2.1.5.a).

AS. Certify that the igniter and S&A are separable from each other (3.2.1.5.b).

AT. Certify the enable function of the S&A device (3.2.1.5.1.a).

AU. Certify the S&A change of position from safe to arm. (3.2.1.5.1.d).

AV. Certify that the S&A device will provide simplex remote position indication (3.2.1.5.1.e).

AW. Certify the igniter design (3.2.1.5.2)

BF. Certify by demonstration the field joint and igniter to case joint leak test compatibility. (3.2.1.8.1.1.b).

BG. Certify that the field joint and the igniter to case joint insulation provide seal protection. (3.2.1.8.1.1.d).

BH. Certify the field joint and igniter to case joint insulation performance during and ambient temperature full duration motor burn. (3.2.1.8.1.1.e).

BI. Certify by inspection that the field joint, case to nozzle and igniter to case joint insulation will withstand slag accumulation during motor operation. (3.2.1.8.1.1.g).

BK Certify that the igniter insulation provides adequate thermal protection for the main igniter chamber and adapter metal parts (3.2.1.8.3).

## 3 .0 APPLICABLE DOCUMENTS

1U75166 Igniter Rocket Motor-Test Configuration, Modified

TWR-16473 Vol VI Qualification and Production Motor Postfire engineering Plan (Igniter Component)

CTP-0028 Space Shuttle Qualification Motor # 6 (QM-6) Static Fire Test Plan

## 4.0 SUMMARY/CONCLUSIONS

### 4.1 Igniter Performance

The overall performance of the igniter components was excellent. Figure 1 illustrates the Igniter and S & A seals and components. The igniter performance was within specified limits as shown in Figure 2. No damage or heat affected areas were noted except for minor seal damage which probably occurred during disassembly.

The sealing elements of the igniter functioned as expected with no evidence of erosion or blowby.

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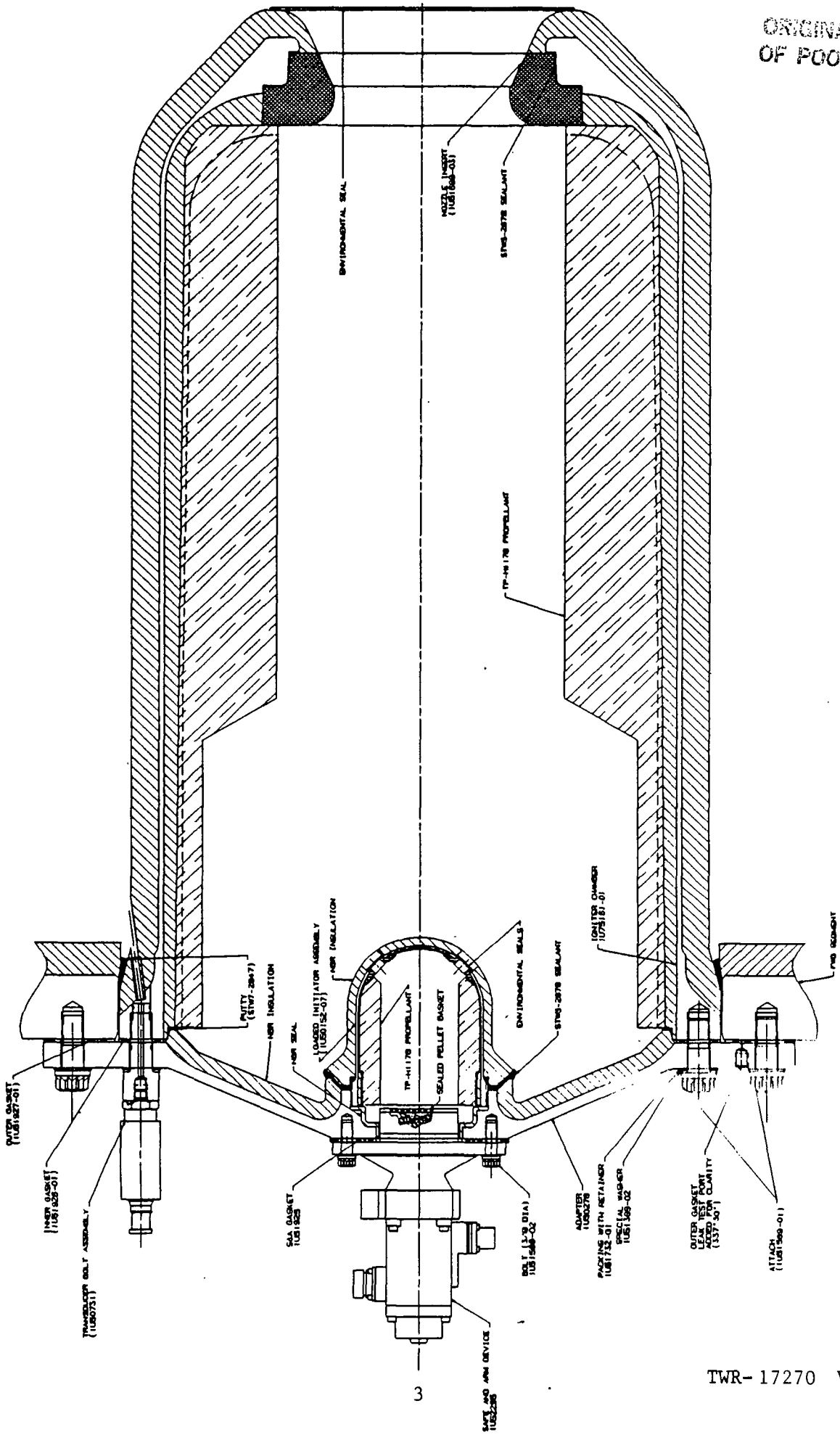


FIGURE 1. IGNITER CROSS SECTION

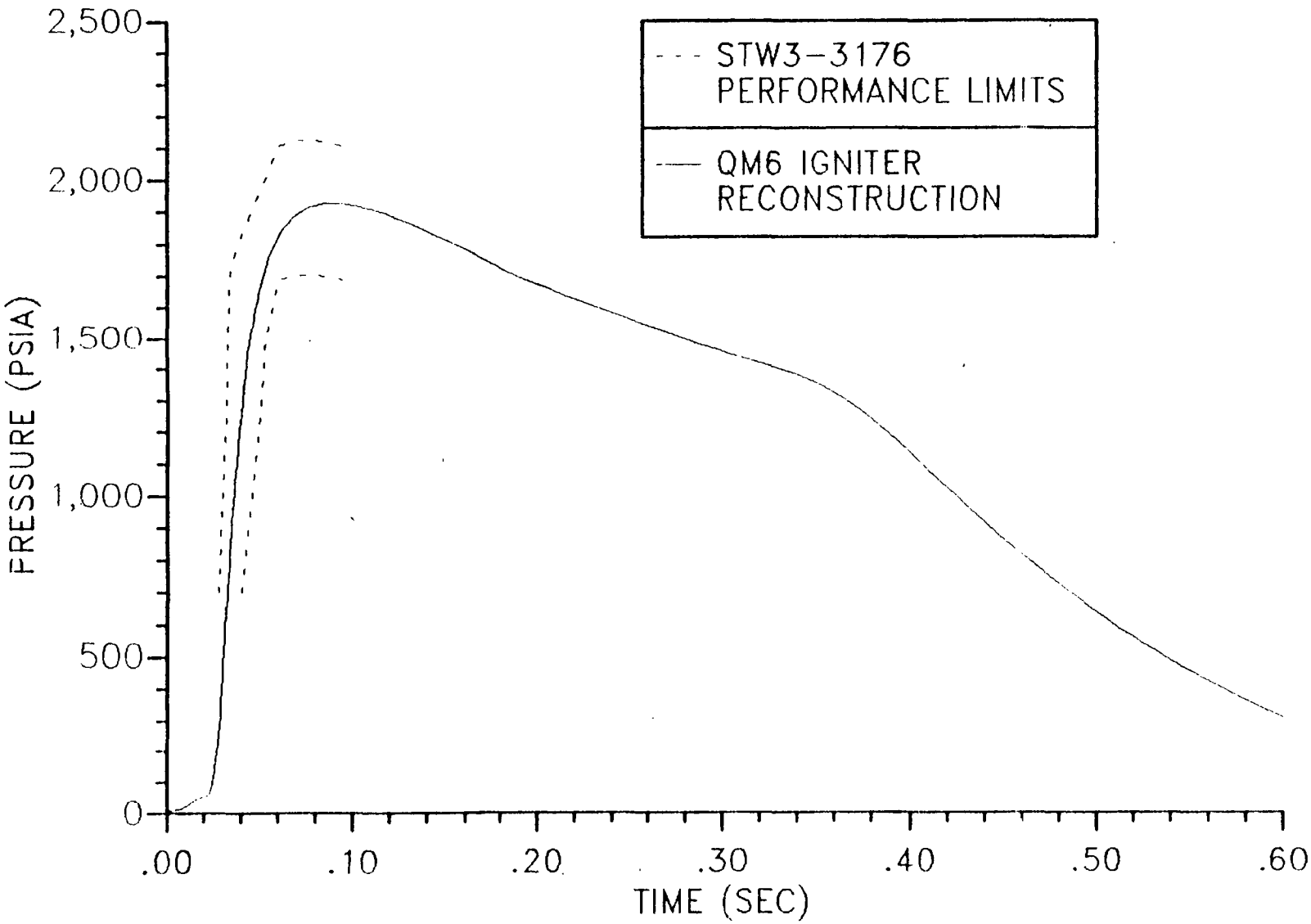


FIGURE 2. IGNITER PERFORMANCE & SPECIFICATION LIMITS

The condition of the igniter to case joint insulation was excellent. The igniter boss insulation exhibited normal erosion on the inboard surface. No edge separations were identified. The igniter chamber interior and exterior insulation was in normal condition. One blowhole through the putty was present, however, no adverse effects on the performance of the joint resulted from the blowhole.

See Table I for a tabulated summary of a one-to-one correlation of the test objectives listed in Section 2 with the observed results.

### 4.2 S&A Device.

The S&A enabled the motor ignition sequence, as evidenced by the successful firing. The S&A was separated from the QM-6 igniter during disassembly at T-24, demonstrating separability.

During the motor firing, the S&A provided simplex position indication to the control center, allowing continuation of the motor countdown.

## 5.0 RESULTS/DISCUSSION

### 5.1 SEALING SYSTEM

#### 5.1.1 Safe and Arm Device to Adapter

The Safe and Arm-to-igniter joint was disassembled on 5 May 1988. The S&A gasket and both S&A and igniter adapter sealing surfaces were thoroughly inspected,revealing no damage, erosion, or heat effect (see Figures 3 and 4). There was no soot to, or past the primary seal. The sealing surfaces of the joint were in excellent condition (see page A-1).

At 225 degrees, a depression of approximately 0.25 in. long, and 0.015 in. deep was found in the crown of the primary seal of the S&A gasket (see pages A-3 through A-5). Thiokol laboratory analysis showed that a combination of mold defect and gas entrapment were the cause of the depression.

#### 5.1.2 Igniter Chamber to Adapter

The igniter adapter-to-chamber joint was disassembled on 3 June 1988. Inspection of the inner gasket revealed no damage, heat effect, or soot to or past the primary seal (see Figures 5 and 6). Light soot was found on the outside edge of the gasket, covering the entire circumference. The sealing surfaces were free of soot and in excellent condition (see pages A-6 through A-11).

TABLE I
QUALIFICATION OBJECTIVES AND RESULTS

| | Qualification Objectives (CEI paragraph number) | Pass/Fail Criteria | Results (Reference Section) |
|---|---|---|---|
| G | Certify that all RSRM seals, including adjustable vent port plug seals, experience no erosion or blowby throughout the static test. (3.2.1.2) | There must be no erosion or blowby for the specified seals (acceptable erosion is allowed on factory joint insulation acting as the primary seal). | No evidence of erosion or blowby past the RSRM seals. (5.1) |
| V | Certify that the ignition system seals, if pressurized, accommodate static test motor structural deflections. (3.2.1.2.4.a) | There must be no erosion or gas leakage past the ignition systems seals due to structural deflections. | No evidence of seal failure. (5.1) |
| W | Certify that the ignition system seals, if pressurized, operate at test temperature, 55° minimum. (3.2.1.2.4.b) | There must be no erosion or gas leakage past the ignition systems seals. | Disassembly showed seals operated correctly and as designed. (5.1) |
| X | Certify that the ignition system seal verification does not degrade the performance or integrity of the sealing system. (3.2.1.2.4.c) | There must be no damage to the ignition system seals due to leak check procedures. | Disassembly verified that seal performance is not degraded. (5.1) |
| AR | Certify that the ignition system precludes hot gas leakage during and subsequent to motor ignition. (3.2.1.5.a) | There must be not hot gas leakage. | Disassembly verified that hot gas leakage was precluded. (5.1) |
| AS | Certify that the igniter and the S&A are separable from each other. (3.2.1.5.b) | Separation of the igniter and S&A will be demonstrated. | The igniter and S&A were separated during teardown, demonstrating that the S&A can be removed from the igniter during routine disassembly. (5.1) |

| | | | |
|---|---|---|---|
| AT | Certify the enable function of the S&A device. (3.2.1.5.1.a) | S&A device barrier-booster assembly must provide the energy flow required to achieve igniter initiation upon command. | The S&A device both enabled and inhibited ignition upon command. (4.2) |
| AU | Certify the S&A change of position from safe to arm and arm to safe. (3.2.1.5.1.d) | S&A will change position from safe to arm and arm to safe. | The S&A changed position from safe to arm and arm to safe upon command. (4.2) |
| AV | Certify that the S&A device will provide simplex remote position indication. (3.2.1.5.1.e) | S&A device must provide remote indication of position in both the safed and armed positions. | The S&A provided remote indication of position. (4.2) |
| AW | Certify the igniter design. (3.2.1.5.2) | There must be no debris formed that can damage any other component which is attributable to the igniter, and the igniter must be installed in only one predetermined rotational position into the igniter port from the outside of the forward segment. | Igniter operated as designed. (4.1) |
| BG | Certify that the field joint, case-to-nozzle joint and igniter-to-case joint insulation provide seal protection. (3.2.1.8.1.1.d) | There must be no erosion or hot gas jetting on the field joint, case-to-nozzle joint or igniter-to-case joint primary and secondary seals. | No evidence of erosion or hot gas jetting on the field joint or case-to-nozzle joint primary and secondary seals. (5.1.2) Igniter-to-case joint information will be included in TWR-17272, Vol II. |
| BH | Certify the field joint and igniter-to-case joint insulation performance during an ambient temperature full duration motor burn. (3.2.1.8.1.1.e) | There must be no thermal degradation to the field joint, case-to-nozzle joint and igniter-to-case joint. | No evidence of thermal degradation to the field joint or case-to-nozzle joint. (5.2) |

| | | | |
|---|---|---|---|
| BI | Certify by inspection that the field joint, case-to-nozzle joint and igniter-to-case joint insulation will withstand slag during motor operation. (3.2.1.8.1.1.g) | Slag accumulation must not cause insulation to fail to provide adequate protection of metal parts. | No evidence that slag adversly affected insulation. Insulation information is included in TWR-17272, Vol III. |
| BK | Certify that the igniter insulation provides adequate thermal protection for the main igniter chamber and adapter metal parts. (3.2.1.8.3) | There must be no damage to the main igniter chamber or adapter metal parts due to temperature effects. | Igniter insulation provided adequate thermal insulation. (5.2) |

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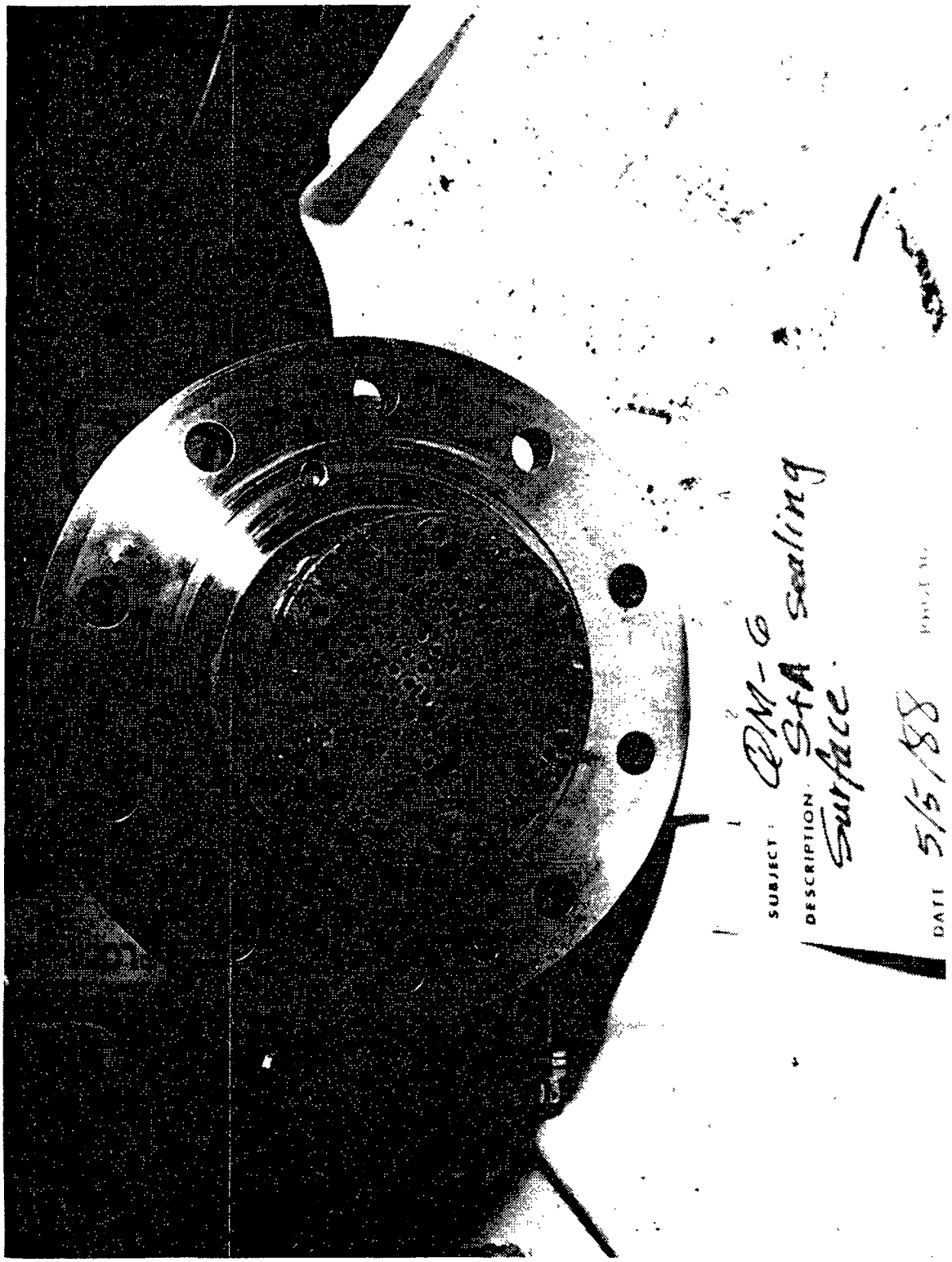


FIGURE 3. S&A SEALING SURFACE

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FIGURE 4. S&A ADAPTER SEALING SURFACE

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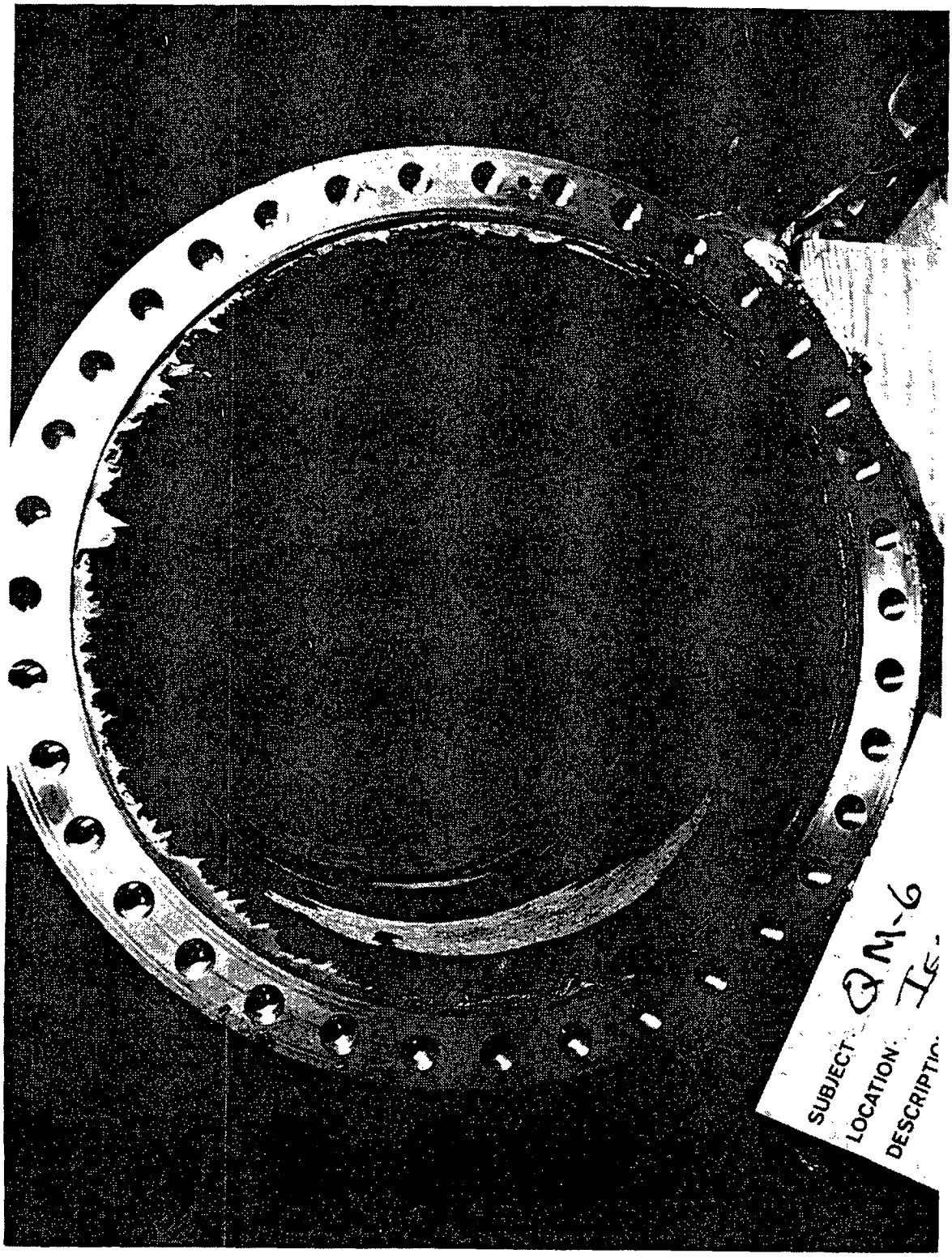


FIGURE 5. IGNITER CHAMBER

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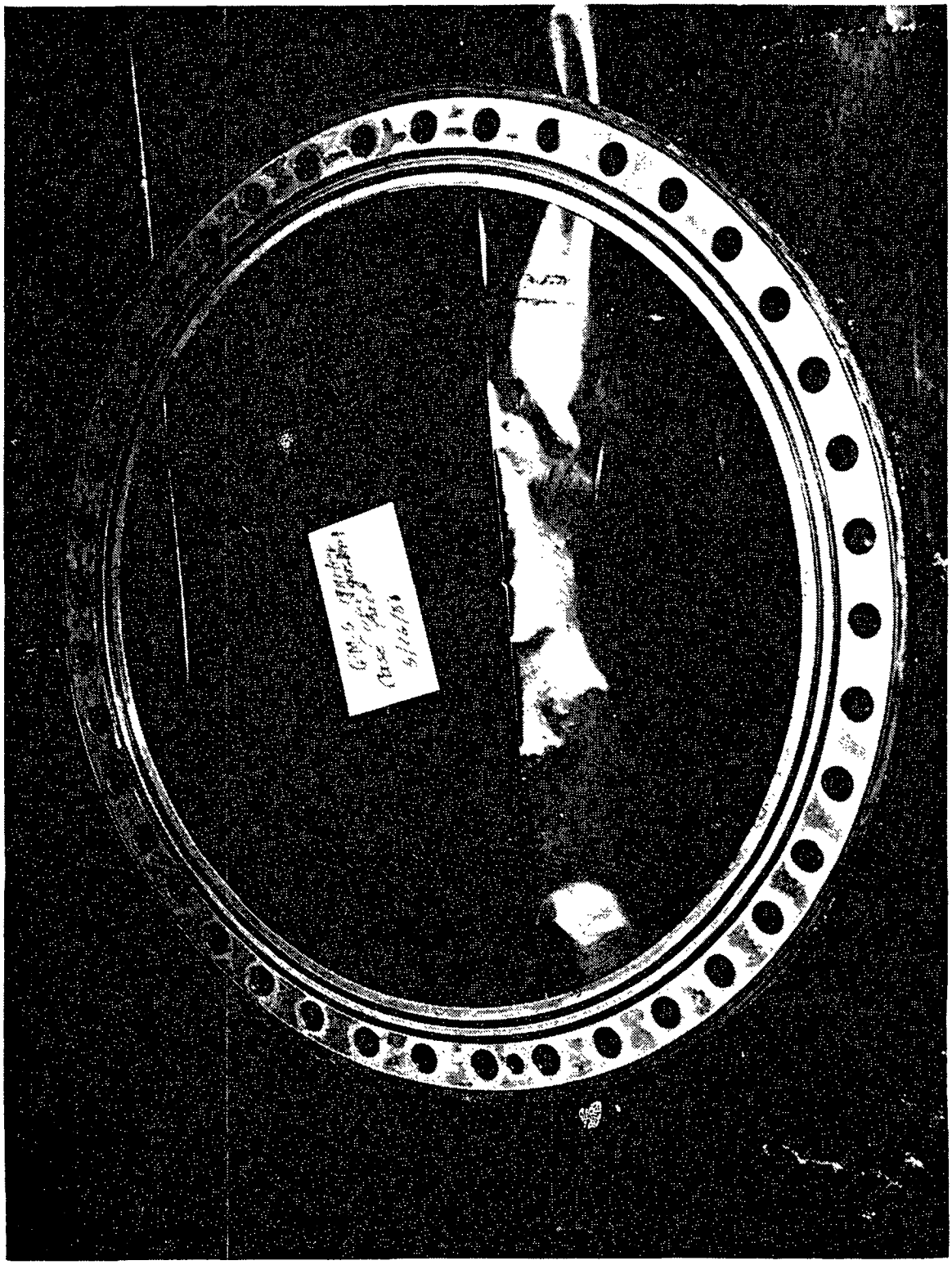

FIGURE 6. IGNITER GASK-O-SEAL

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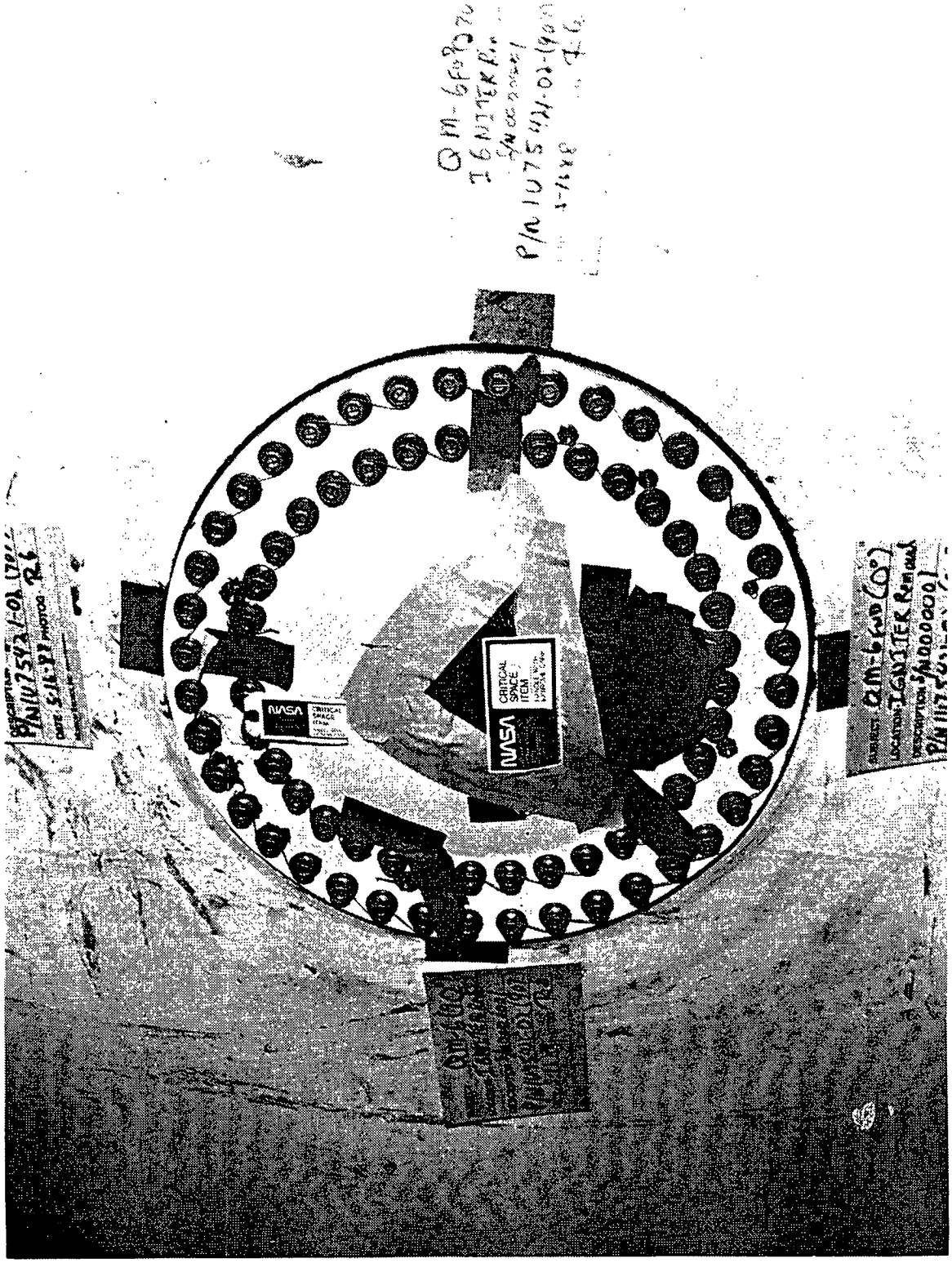


FIGURE 7. IGNITER PRIOR TO REMOVAL



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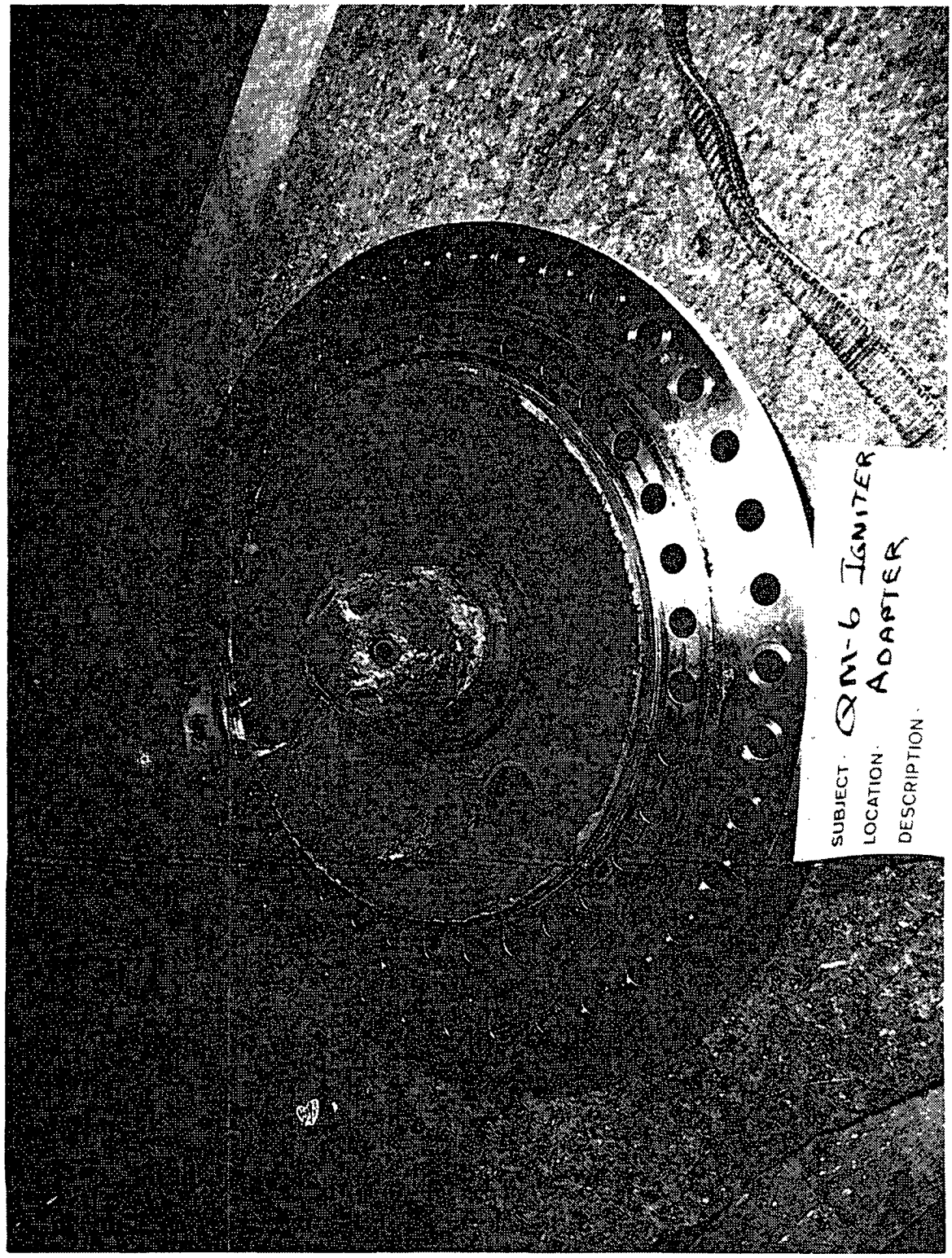


FIGURE 8. IGNITER ADAPTER

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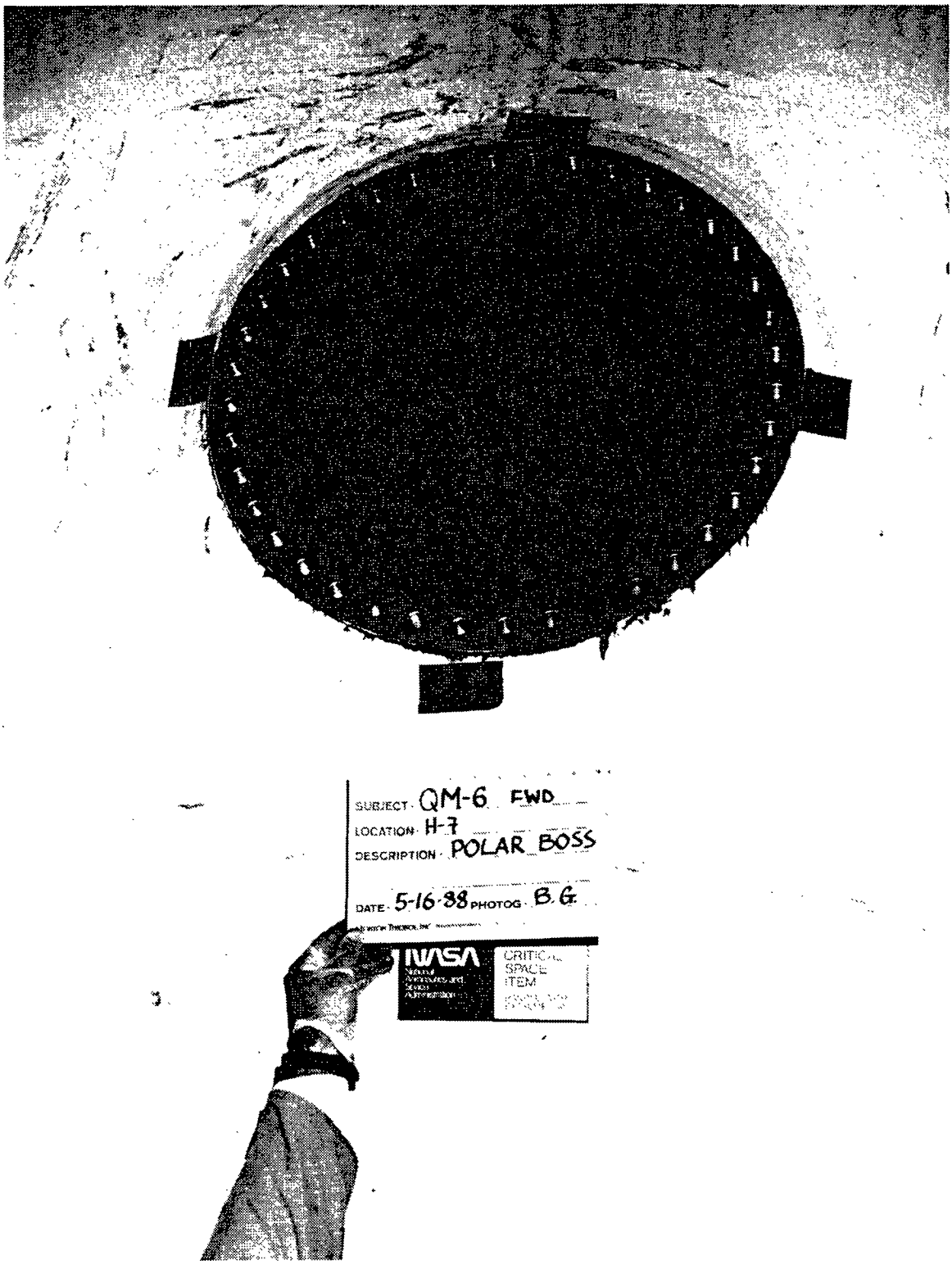


FIGURE 9. POLAR BOSS

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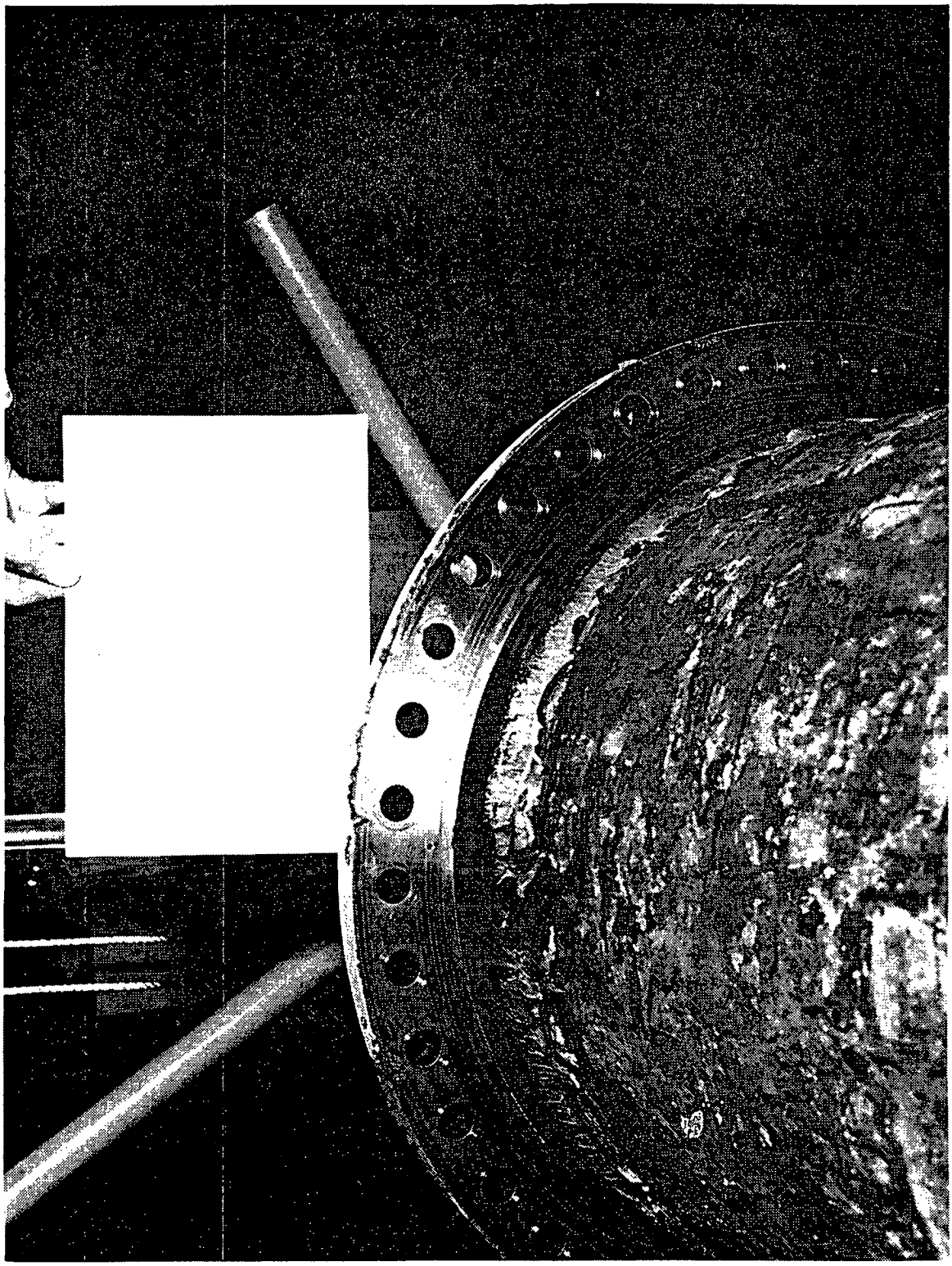

FIGURE 10. IGNITER ADAPTER SEALING SURFACE

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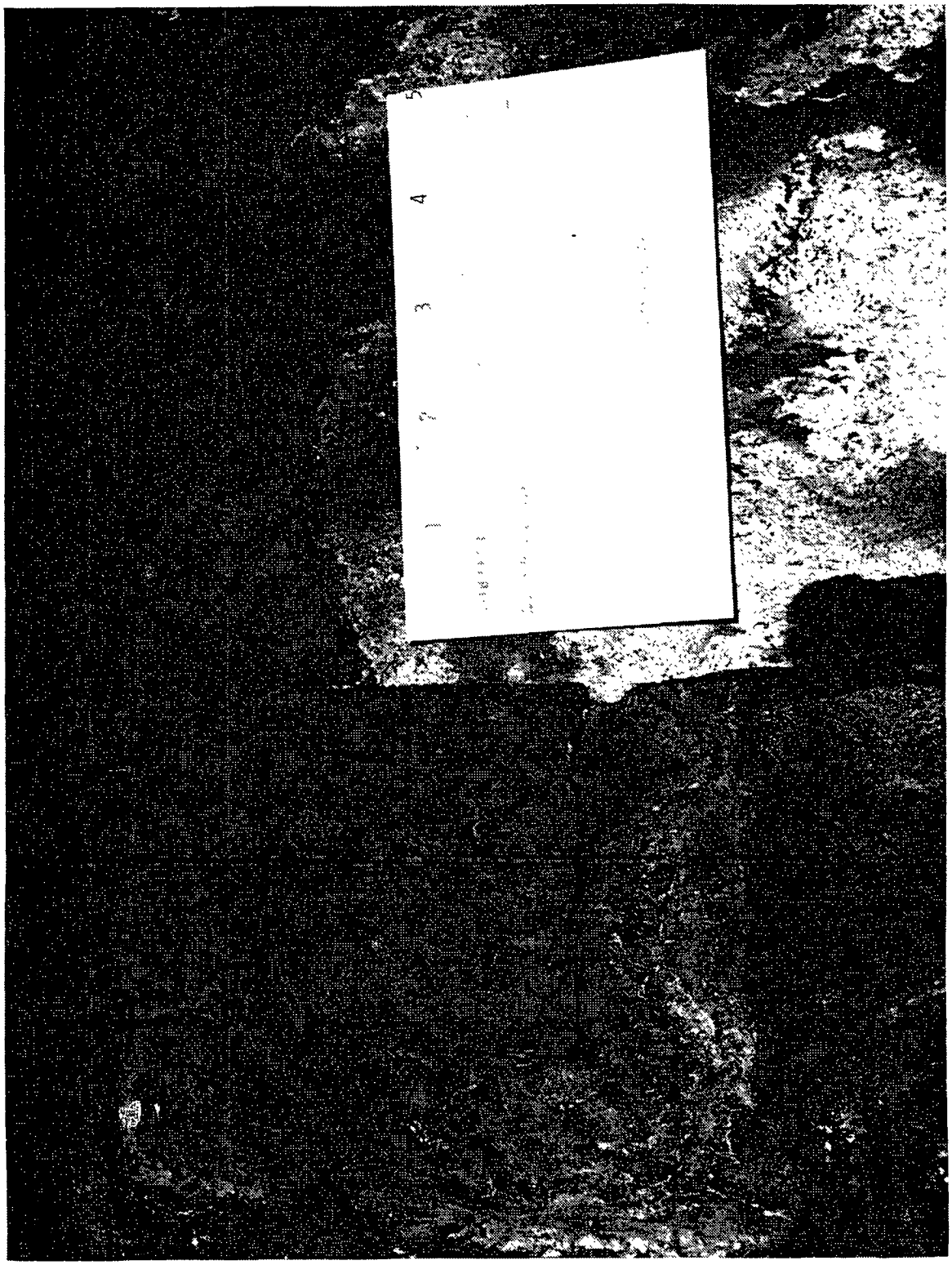
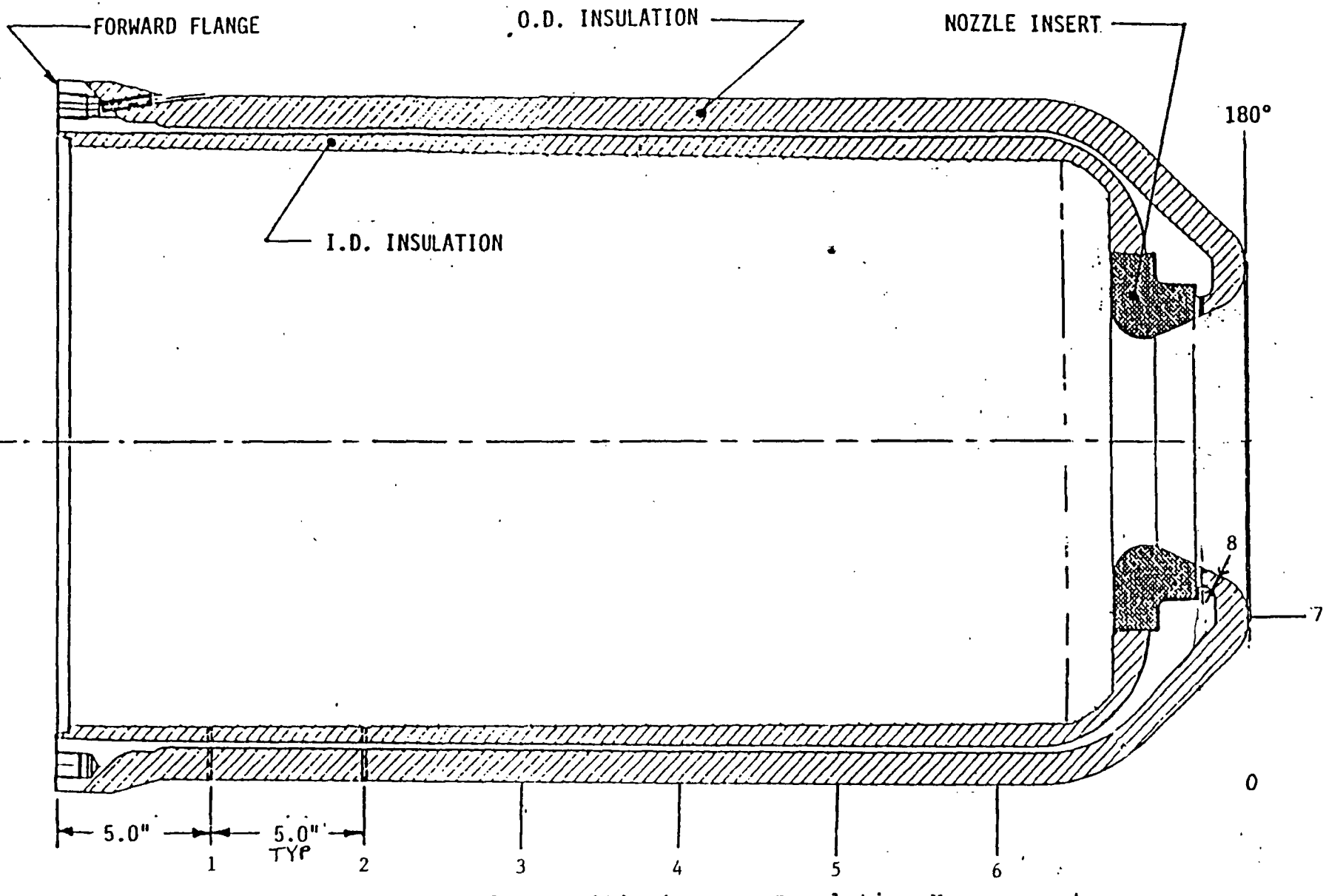


FIGURE 11. IGNITER INSULATION REPAIR PATCH




Post Test Plug Positioning For Insulation Measurements

FIGURE 12

IGNITER INSULATION HISTORY

| MOTOR | LOCATION | PRE FIRE THICKNESS | | | | | | | | POST FIRE THICKNESS | | | | | | | | FACTOR OF SAFETY | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| DM-9 | 0 DEGREES | 1.04 | 1.01 | 1 | 1 | 1.1 | 1.03 | 1.1 | 0.4 | 0.807 | 0.843 | 0.76 | 0.764 | 0.736 | 0.781 | 0.775 | 0.128 | 4.46 | 6.04 | 4.16 | 4.23 | 3.02 | 4.13 | 3.38 | 1.47 |
| | 180 DEGREES | 0.99 | 1.01 | 1 | 0.98 | 1.02 | 1.04 | 1.07 | 0.4 | 0.872 | 0.816 | 0.787 | 0.796 | 0.762 | 0.731 | 0.761 | 0.142 | 8.38 | 5.20 | 4.69 | 5.32 | 3.95 | 3.36 | 3.46 | 1.55 |
| QM-6 | 0 DEGREES | 1.039 | 1.03 | 1.021 | 1.021 | 0.992 | 1.097 | 1.064 | 0.383 | 0.838 | 0.848 | 0.93 | 0.8 | 0.777 | 0.768 | 0.969 | 0.183 | 5.16 | 5.65 | 11.2 | 4.61 | 4.61 | 3.33 | 11.2 | 1.92 |
| | 180 DEGREES | 0.99 | 0.967 | 1.009 | 1.011 | 1.006 | 1.026 | 1.003 | 0.382 | 0.799 | 0.82 | 0.838 | 0.738 | 0.759 | 0.722 | 0.96 | 0.182 | 5.18 | 5.91 | 5.90 | 3.70 | 4.07 | 3.37 | 23.3 | 1.91 |

N/A = NOT AVAILABLE

INCOR = MEASUREMENT TAKEN AT WRONG LOCATION OR CHAR WAS NOT REMOVED

TABLE II. IGNITER INSULATION HISTORY

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FIGURE 13. NOZZLE INSERT

nozzle throat measurements are as follow:

| Position | Measurement |
|---|---|
| 0 degrees | 5.976 in. |
| 60 degrees | 5.980 in. |
| 120 degrees | 5.960 in. |

## 6.0 METAL COMPONENTS

No structural damage or heat affect was noted on any metal components. Light corrosion was found on the adapter sealing surface. No bolts showed signs of yielding or damage. Figures 5 and 10 are pictures of the igniter case after disassembly (see page A-21).

## 7.0 IGNITION SYSTEM COMPONENT TEAM RECOMMENDATIONS

The Igniter System Components Program team has reviewed all observations and determined that only a potential anomaly exists. This is the blowhole found in the outer joint putty. The decision was made to continue to use the present design.

## 8.0 IGNITER PEDIGREE AND MEASURED PERFORMANCE (QM-6)

| | |
|---|---|
| Part Number: | 1U75163-01 |
| Serial Number: | 00000010 |
| Lot Number: | 38 |
| Evaluation: | F700001 |
| Casting Date: | 11-Nov-1988 |
| PBMT: | 70° F |
| 5 In CP Burn Rate: | .905 IN/SEC @ 2000 PSIA & 60° F |
| Target Burn Rate: | .877 IN/SEC @ 2000 PSIA & 60° F |
| Delivered Burn Rate: | .8789 IN/SEC @ 2000 PSIA & 60° F |
| Scale Factor: | .971 |
| Igniter PMAX: | 1903.8 PSIA |
| Time of IPGM: | .0900 SEC |
| Time of 10% PMAXIG: | .0238 SEC |
| Time of 700 PSIA: | .0332 SEC |
| Time of 90% PMAXIG: | .0532 SEC |
| Max Mass Flow Rate: | 340.74 LBM/SEC |
| Throat Area: | 28.51 $M^2$ |
| C Star | 5125.0 |

# APPENDIX A
# EVALUATION CHECKOFF WORKSHEETS

MORTON THIOKOL INC.
Wasatch Operations

Table A-II

Safe & Arm - Evaluation Checkoff Worksheet

Inspector(s): D. Ballard

Motor No.: QM-6 | Date: 5-10-88

| | | | |
|---|---|---|---|
| I. | Heat Affect (Blisters or Discoloration)? | ____ yes | X no |
| II | Physical Damage (Nicks, Scratches, Gouges)? | ____ yes | X no |
| III. | Corrosion? | ____ yes | X no |

If yes, note:

| Condition (I, II, or III) | Degree Location (Deg.) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

Notes / Comments

Table D-I

Preliminary Igniter Gasket – Evaluation Checkoff Worksheet

Inspector(s): L. Nelsen, G. Abbasi

Motor No.: QM-6 | Date: 5/5/88

Gasket: ☐ Inner ☐ Outer ☒ S&A

I. Gasket Identification Position — X Forward Face — X Aft Face

II. Soot Past Seals? ____ yes ____ no

If yes:

| Gasket Side | Seal I. D. (Prim. or Sec.) | Degree Location (Deg) | Degree Arc |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

III. Foreign Material? ____ yes X no

If yes:

| Gasket Side | Material | Degree Location (Deg) | Degree Arc |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

IV. Seal Damage? ____ yes X no

If yes:

| Gasket Side | Seal I. D. (Prim. or Sec.) | Condition | Degree Location (Deg) | Degree Arc |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Notes / Comments

Table D-I (Cont'd)
Preliminary Igniter Gasket - Evaluation Checkoff Worksheet

Inspector(s): G. Abawi, L. Nelsen

Motor No.: QM-6 | Date: 5/5/88

Gasket: ☐ Inner ☐ Outer ☒ S&A

V. Heat Affected Seals or Retainer? ____ yes X no

If yes, note the affected part (primary seal (PS), secondary seal (SS) or retainer (R)) and the indicated data:

| Affected Part (PS, SS, R) | Gasket Side | Degree Location (Deg) | Degree Arc |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

VI. Rust? ____ yes X no

If yes:

| Gasket Side | Degree Location (Deg) | Degree Arc |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

VII. Metal Damage? ____ yes X no

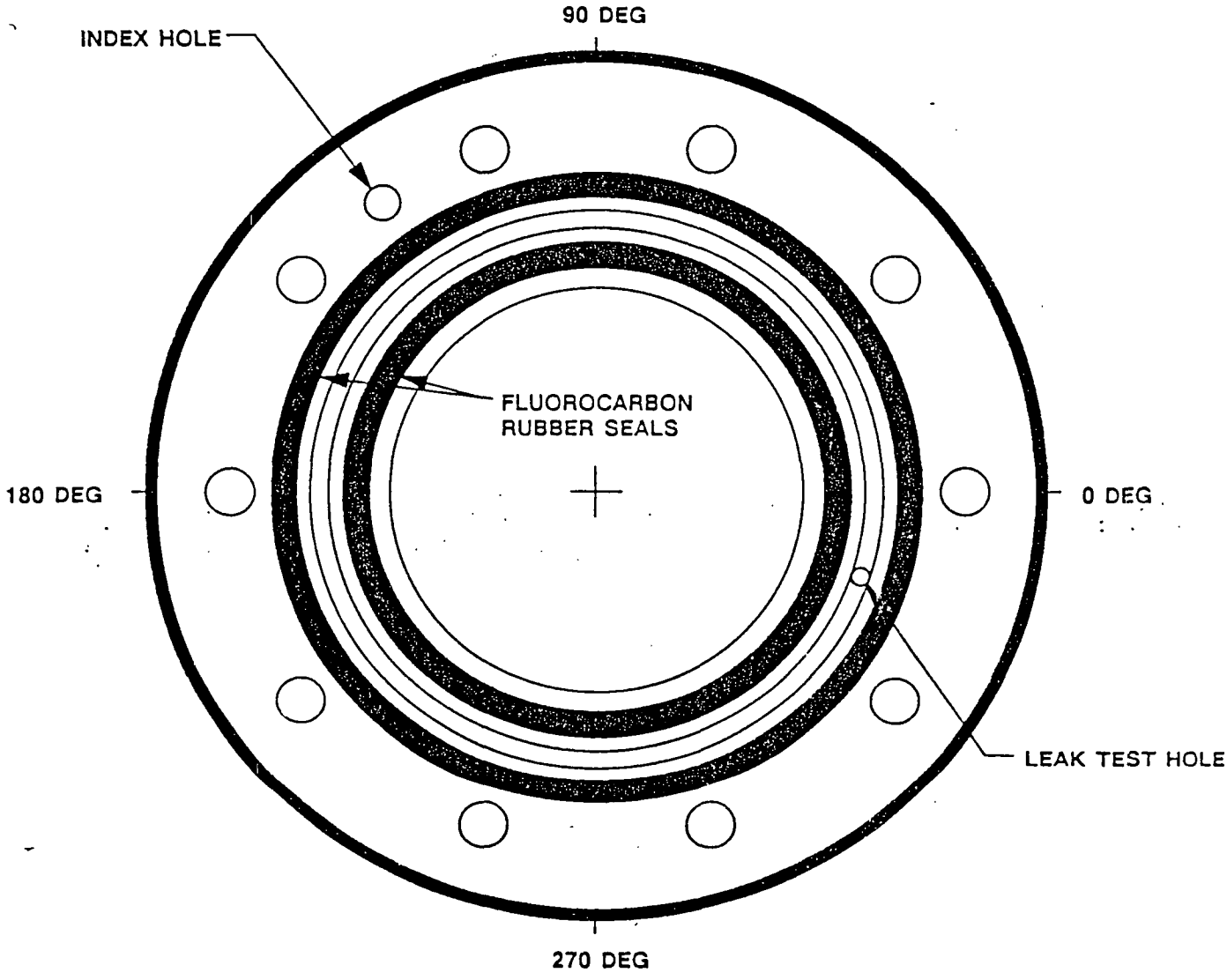
If yes:

| Type of Damage | Gasket Side | Degree Location (Deg) | Degree Arc |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

Notes / Comments

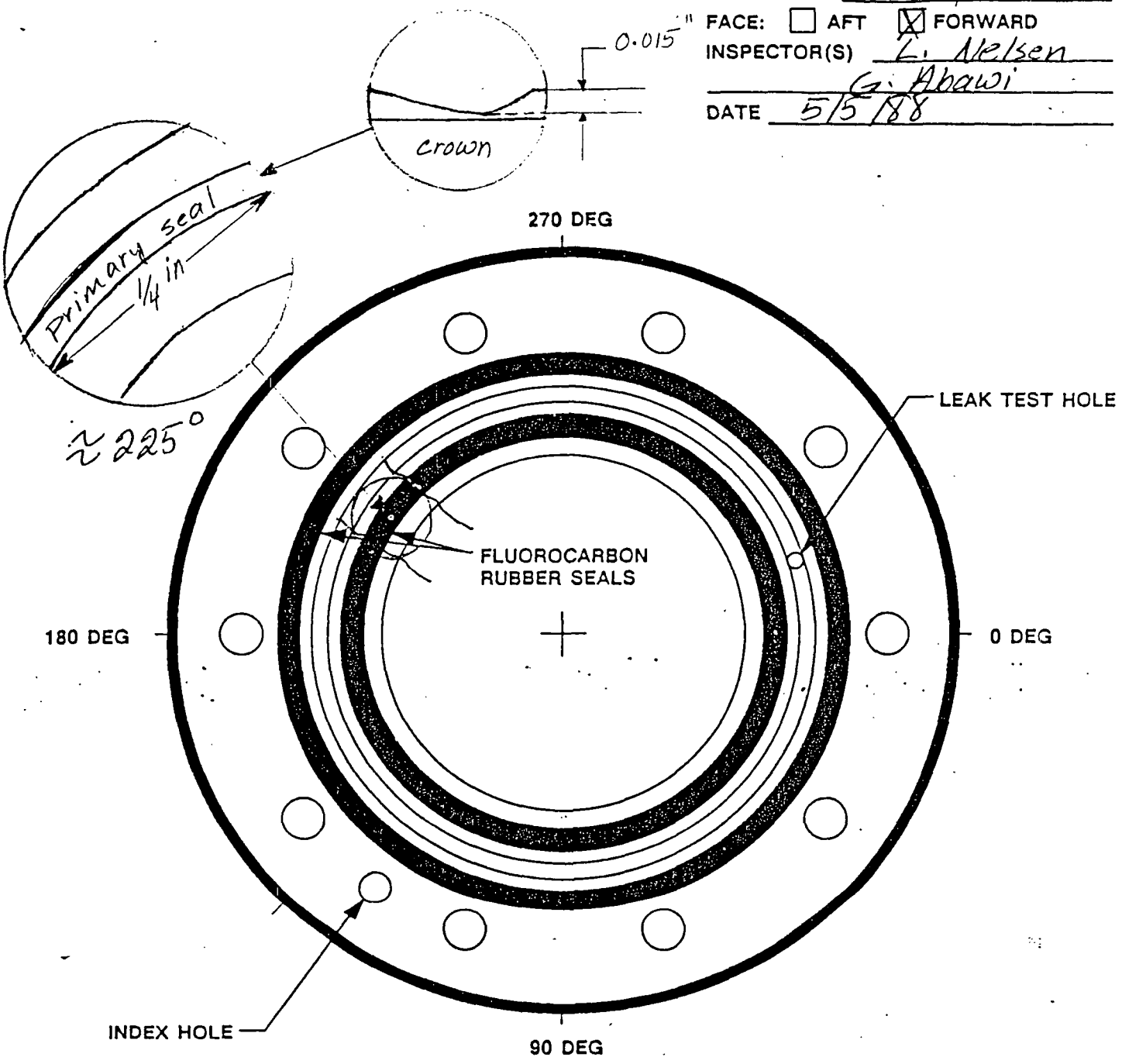
Forward Face: A depression of approximately 0.25 in. long, and 0.015 in deep was discovered on the crown of the primary seal of the S+A gasket.

MOTOR NO. QM-6
INSPECTOR(S) L. Nelsen
G. Abawi
DATE 5/5/88



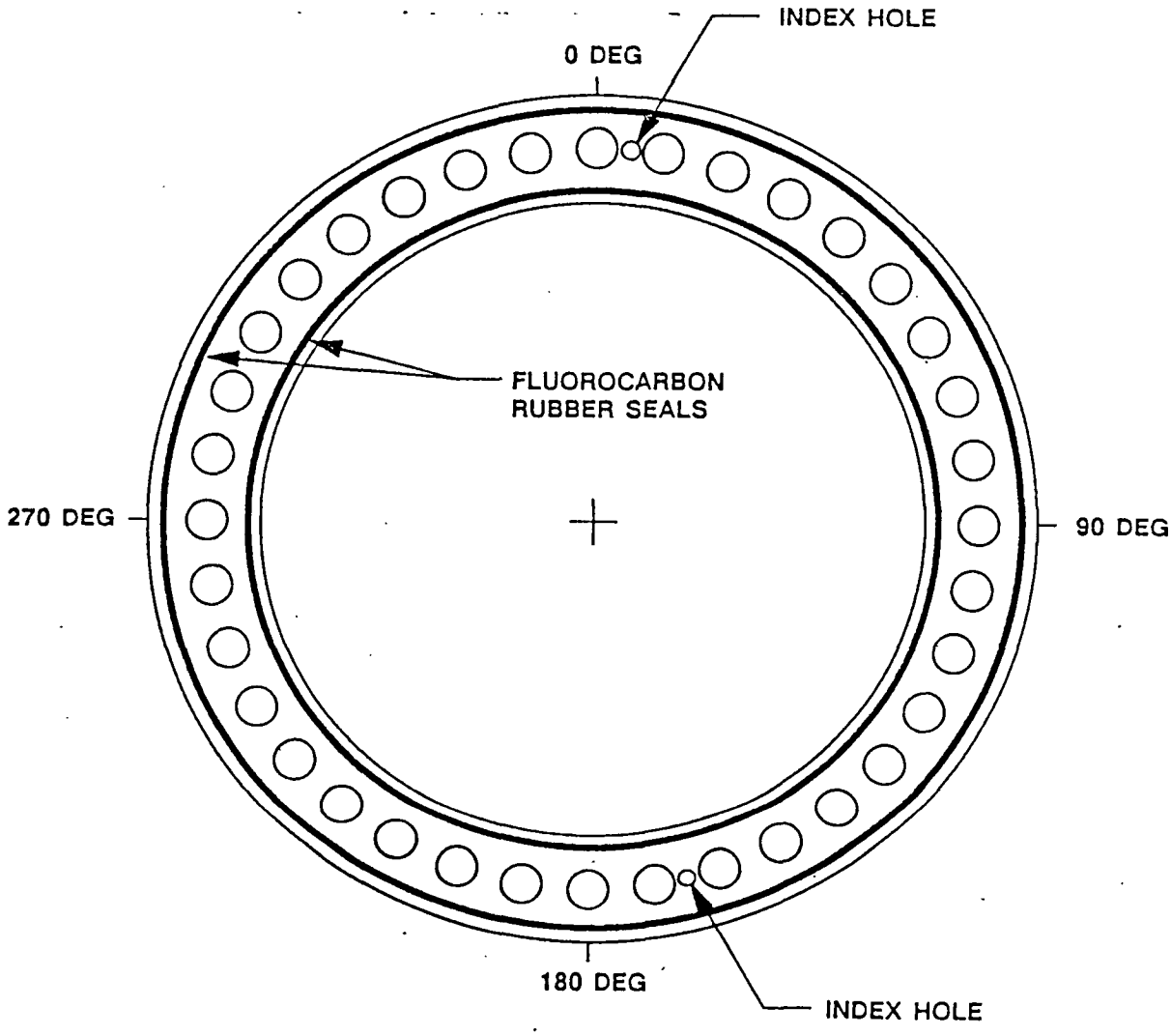

Observation Drawing Worksheet – Igniter S&A Gasket (Aft Face)
Figure D-2

MOTOR NO. QM-6
FACE: ☐ AFT ☒ FORWARD
INSPECTOR(S) L. Nelsen
G. Abawi
DATE 5/5/88



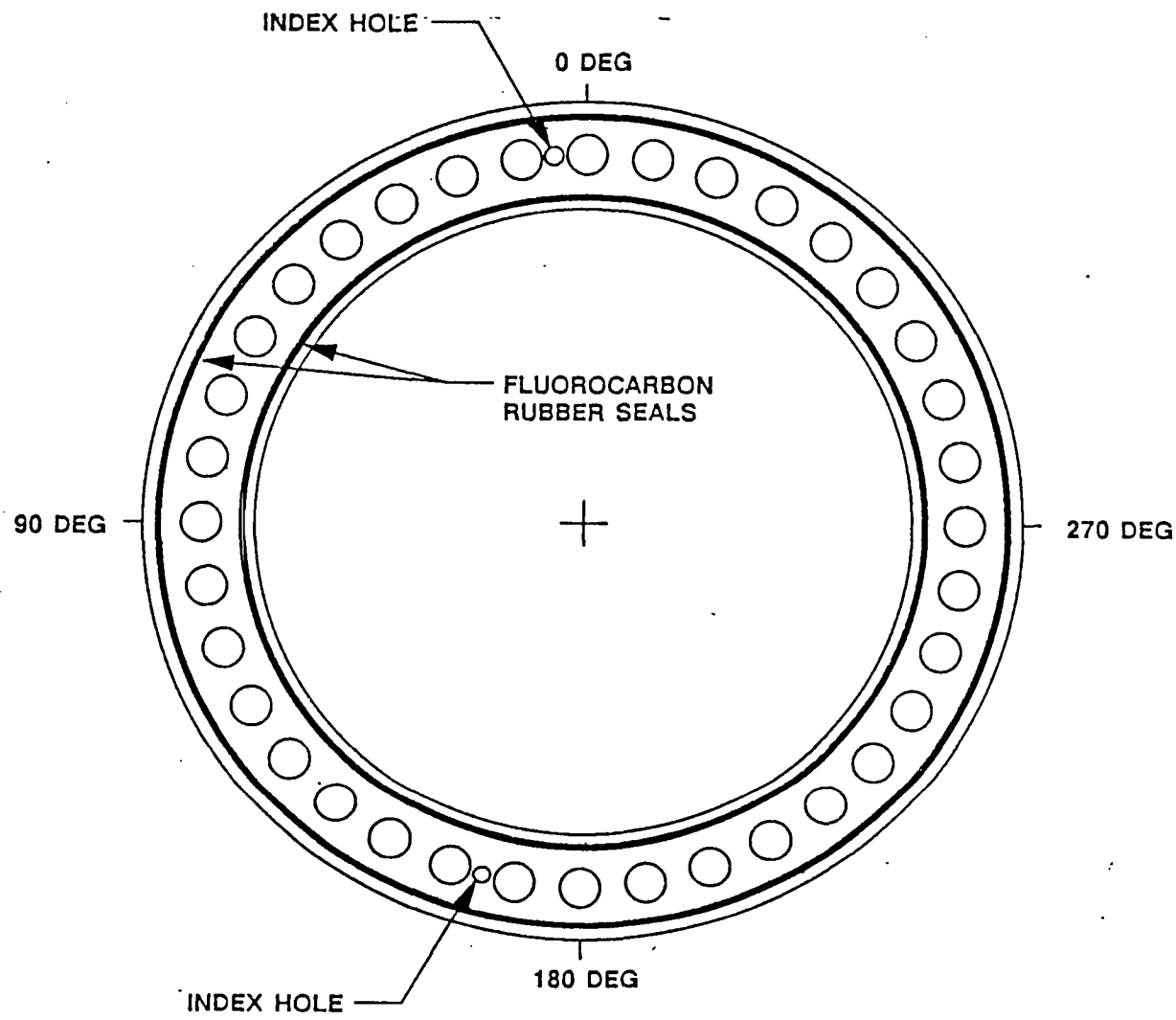

Observation Drawing Worksheet – Igniter S&A Gasket (Forward Face)
Figure D-1

MOTOR NO QM-6
INSPECTOR(S) G. Akerman
DATE 6/3/88




Observation Drawing Worksheet – Igniter Inner Gasket (Aft Face)
Figure D-6

MOTOR NO QM-6
INSPECTOR(S) G. Abawi
DATE 6/3/88




Observation Drawing Worksheet – Igniter Inner Gasket (Forward Face)
Figure D-5

Table D-II

Detailed Igniter Gasket - Evaluation Checkoff Worksheet (A-2)

Inspector(s): George Abawi

Motor No.: QM-6 | Date: 6/3/88

Gasket: ☒ Inner ☐ Outer ☐ S&A

I. Gasket Identification Position — X Forward Face — X Aft Face

II. Soot Past Seals? ____ yes X no

If yes:

| Gasket Side | Seal I. D. (Prim. or Sec.) | Degree Location (Deg) | Radial Distance (In.) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

III. Foreign Material? ____ yes X no

If yes:

| Gasket Side | Material | Degree Location (Deg) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

IV. Seal Damage? ____ yes X no

If yes:

| Gasket Side | Seal I. D. (Prim. or Sec.) | Condition | Degree Location (Deg) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
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Notes / Comments

Table D-II (Cont'd)

Detailed Igniter Gasket - Evaluation Checkoff Worksheet (A-2)

Inspector(s): G. Alaoui

Motor No.: QM-6 | Date: 6/3/88

Gasket: ☒ Inner ☐ Outer ☐ S&A

V. Heat Affected Seals or Retainer? ____ yes X no

If yes, note the affected part (primary seal (PS), secondary seal (SS) or retainer (R)) and the indicated data:

| Affected Part (PS, SS, R) | Gasket Side | Degree Location (Deg) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

VI. Rust? ____ yes X no

If yes:

| Gasket Side | Degree Location (Deg) | Radial Distance (In.) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

VII. Metal Damage? ____ yes X no

If yes:

| Type of Damage | Gasket Side | Degree Location (Deg) | Radial Distance (In.) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Notes / Comments

Table D-III

Ignition System Sealing Surface Condition – Evaluation Checkoff Worksheet

Inspector(s): George Abawi

Motor No.: QM-6 | Date: 6/3/88

Joint: ☐ S&A to Adapter ☐ Adapter to Case ☒ Adapter to Chamber

A. Rust on Metal Parts (Corrosion)? ____ yes X no

B. Metal Damage? ____ yes X no

Clarify below or on a OCF, if necessary

C. Heat Affected or Sooted? ____ yes X no

If any of the above conditions exist, record affected part (adapter, chamber, dome or S&A) and the indicated data below:

| Condition Indicate with: A, B or C | Affected Part | Degree Location (Deg.) | Radial Distance (In.) | Degree Arc | Circumferential Width (In.) |
|---|---|---|---|---|---|
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Notes / Comments

Table D-IV

Ignition System Joint Plug – Evaluation Checkoff Worksheet

| | | |
|---|---|---|
| Inspector(s): George Abawi | | |
| Motor No.: QM-6 | Date: 6/3/88 | |
| Joint: ☐ Adapter/Case | ☒ Adapter/Chamber | |
| Degree Location: 305° | | |

| | | | |
|---|---|---|---|
| I. | Soot Past Seals? | ____ yes | X no |
| II. | Foreign Material? | ____ yes | X no |
| III. | Seal Damage? | ____ yes | X no |
| IV. | Heat Affected Seals or Plug? | ____ yes | X no |
| V. | Rust? | ____ yes | X no |
| VI. | Metal Damage? | ____ yes | X no |

If any of these conditions are found note the following:

| Condition (I, II, III, IV, V or VI) | Type of Material or Damage | Affected Part | Seal (Primary or Secondary) |
|---|---|---|---|
| | | | |
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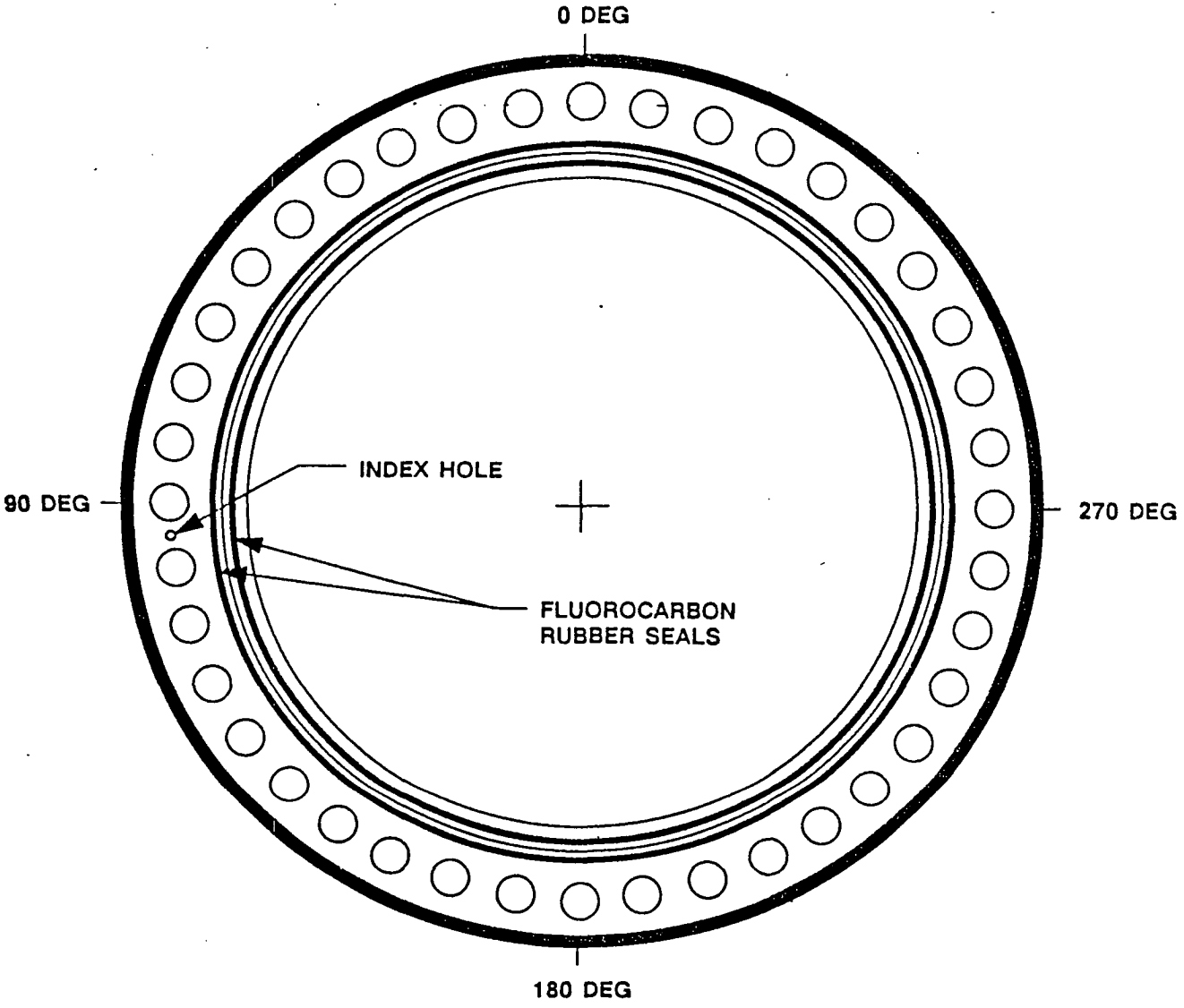
Notes / Comments

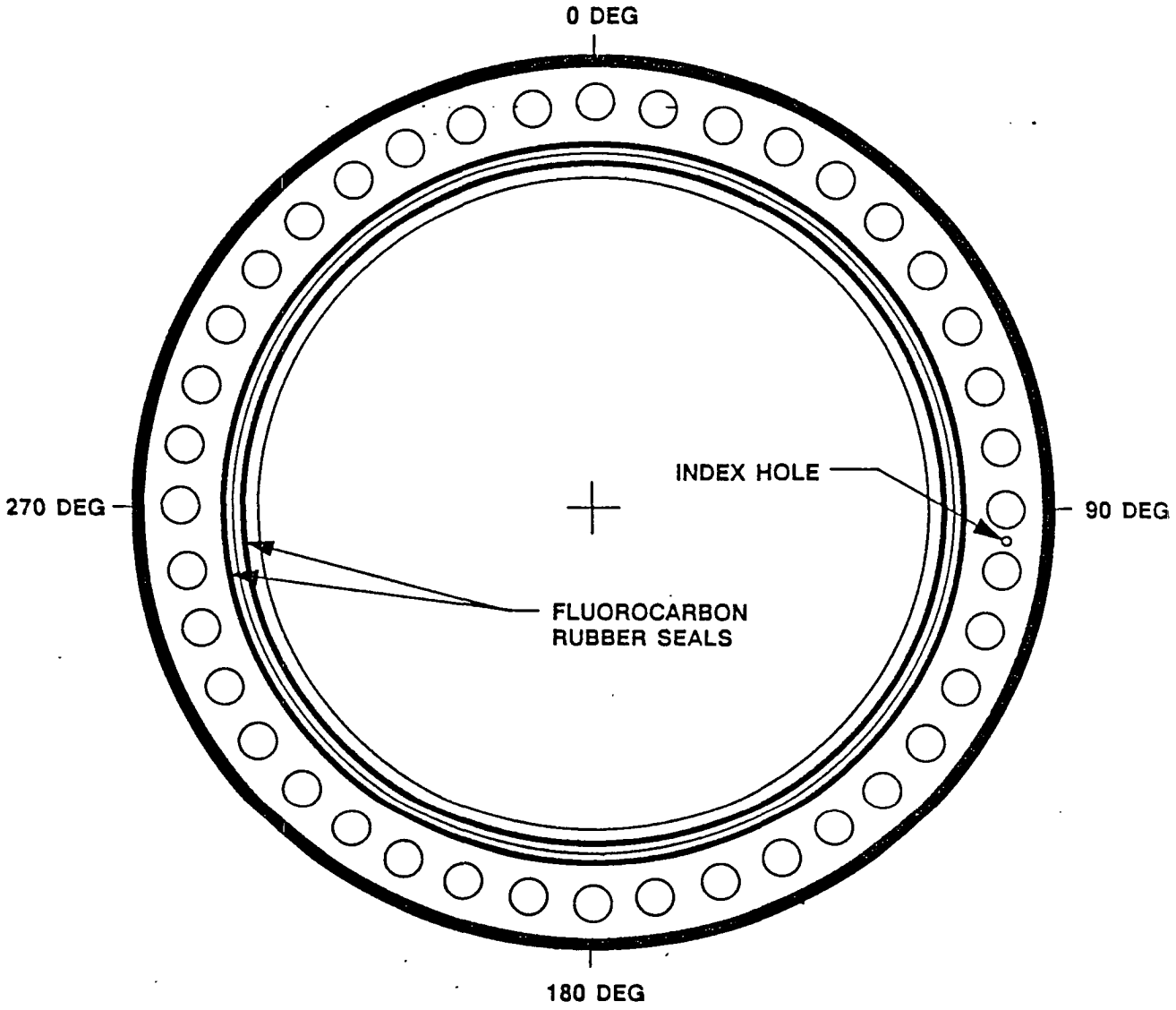
MOTOR NO. QM-6
INSPECTOR(S) G. Akawi
DATE 5/16/88




Observation Drawing Worksheet – Igniter Outer Gasket (Forward Face)
Figure D-3

MOTOR NO. QM-6
INSPECTOR(S) G. Abawi

DATE 5/16/88




Observation Drawing Worksheet – Igniter Outer Gasket (Aft Face)
Figure D-4

Table D-II

Detailed Igniter Gasket - Evaluation Checkoff Worksheet (A-2)

Inspector(s): G. Abawi

Motor No.: QM-6 | Date: 5/16/88

Gasket: ☐ Inner ☒ Outer ☐ S&A

I. Gasket Identification Position X Forward Face X Aft Face

II. Soot Past Seals? ____ yes X no

If yes:

| Gasket Side | Seal I. D. (Prim. or Sec.) | Degree Location (Deg) | Radial Distance (In.) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
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| | | | | | |

III. Foreign Material? ____ yes X no

If yes:

| Gasket Side | Material | Degree Location (Deg) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

IV. Seal Damage? ____ yes X no

If yes:

| Gasket Side | Seal I. D. (Prim. or Sec.) | Condition | Degree Location (Deg) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|---|
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Notes / Comments

Table D-II (Cont'd)

Detailed Igniter Gasket – Evaluation Checkoff Worksheet (A-2)

Inspector(s): G. Abawi

Motor No.: QM-6 | Date: 5/16/88

Gasket: ☐ Inner ☒ Outer ☐ S&A

V. Heat Affected Seals or Retainer? ____ yes X no

If yes, note the affected part (primary seal (PS), secondary seal (SS) or retainer (R)) and the indicated data:

| Affected Part (PS, SS, R) | Gasket Side | Degree Location (Deg) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

VI. Rust? ____ yes X no

If yes:

| Gasket Side | Degree Location (Deg) | Radial Distance (In.) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

VII. Metal Damage? ____ yes X no

If yes:

| Type of Damage | Gasket Side | Degree Location (Deg) | Radial Distance (In.) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|---|
| | | | | | |
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Notes / Comments

Soot on the inside edge of the gasket.

Table D-III

Ignition System Sealing Surface Condition – Evaluation Checkoff Worksheet

Inspector(s): G. Abawi

Motor No.: QM-6 | Date: 5/16/88

Joint: ☐ S&A to Adapter ☒ Adapter to Case ☐ Adapter to Chamber

A. Rust on Metal Parts (Corrosion)? ____ yes X no

B. Metal Damage? ____ yes X no

Clarify below or on a OCF, if necessary

C. Heat Affected or Sooted? ____ yes X no

If any of the above conditions exist, record affected part (adapter, chamber, dome or S&A) and the indicated data below:

| Condition Indicate with: A, B or C | Affected Part | Degree Location (Deg.) | Radial Distance (In.) | Degree Arc | Circumferential Width (In.) |
|---|---|---|---|---|---|
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Notes / Comments

REVISION
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Table B-I

Igniter Insulation - Evaluation Checkoff Worksheet

Inspector(s): P McCluskey

Motor No.: QM-6 | Date: 5-16-88

Part:
- [X] A. Adapter
- [X] B. Ingiter Chamber Exterior
- [X] C. Initiator Chamber Exterior
- [X] D. Igniter Chamber Interior

I. Severe or Abnormal Insulation Erosion? ____ yes X no

II. Blistering? ____ yes X no

If yes, record:

| Condition (I or II) | Axial Location (In.) (B, C, D Only) | Radial Location (In.) (A Only) | Degree Location (Deg.) | Axial Length (In.) (B,C,D Only) | Radial Distance (In.) (A Only) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
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Notes / Comments

1) Insulation char and erosion looked normal. Thickness checks will be taken later

2) The repair patch at 0° appeared to have performed as expected. ~~Pat~~ Patch was eroded away but the plug remained in place. After chamber insulation is washed out further inspection will be performed

3) Three holes were repaired at the aft end of the igniter. There was no evidence ~~of the~~ The repair failed. Detailed inspection will be done ~~after~~ insulation removal.

MORTON THIOKOL INC.
Wasatch Operations

Table A-I

External Ignition System - Evaluation Checkoff Worksheet

Inspector(s): P McCluskey

Motor No.: QM-6 | Date: 5-16-85

I. Hotspots (Blisters or Discoloration) on Igniter Adapter? ____ yes X no

If yes:

| Condition | Degree Location (Deg.) | Radial Location (In.) | Radial Distance (In.) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

II. Physical Damage (Nicks, Scratches, Gouges)?

A. Adapter ____ yes X no
B. Adapter Bolts (Outer Circle) ____ yes X no
C. Adapter Bolts (Inner Circle) ____ yes X no
D. S&A Bolts ____ yes X no

If yes, note the affected part (A, B, C or D) and the indicated data:

| Affected Part | Condition | Degree Location (Deg.) | Radial Location (In.) | Radial Distance (In.) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
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| | | | | | | |

III. Corrosion?

A. Adapter ____ yes X no
B. Adapter Bolts (Outer Circle) ____ yes X no
C. Adapter Bolts (Inner Circle) ____ yes X no
D. S&A Bolts ____ yes X no

If yes, note the affected part (A, B, C or D) and the indicated data:

| Affected Part | Degree Location (Deg.) | Radial Location (In.) | Radial Distance (In.) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|---|
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Notes / Comments

MORTON THIOKOL INC.
Wasatch Operations

Table A-V

Igniter Putty Condition - Evaluation Checkoff Worksheet

Inspector(s): P McCluskey

Motor No.: QM-6 | Date: 5-16-85

Joint: [X] Adapter to Case [ ] Adapter to Chamber

A. Putty Condition

1. Color? ____ Variable X Constant

2. Tack? X Good ____ Nominal ____ Poor

B. Putty Gas Paths? X Yes ____ No

C. Putty Adhesive/Cohesive Failure? ____ Yes ____ No

Clarify below or on a OCF, if necessary

If any of the above conditions exist, record indicated data below:

| Condition Indicate with: B or C | Affected Part (Adapter or Dome) | Degree Location (For B & C) | Degree Arc (For B & C) | Circumferential Width (For B & C) |
|---|---|---|---|---|
| B | | 340-350 | | .350 |
| | | | | |
| | | | | |
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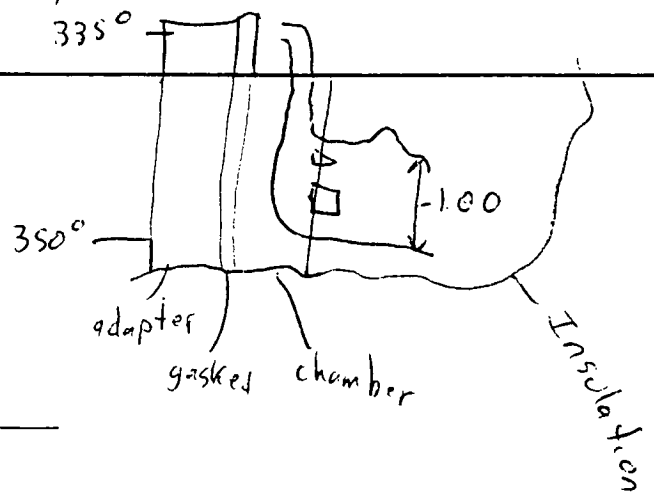
Notes / Comments

Soot on Igniter chamber
Light soot - 100°-270°
Med soot - 270°-310°
Heavy soot - 310°-40°

} No heat affect on metal parts. Small rust from 0-30° on adapter




REVISION ____

Table A-VI

Igniter Nozzle Insert - Evaluation Checkoff Worksheet

Inspector(s): P McCluskey

Motor No.: QM-C | Date: 5-16-85

I. Cracked Nozzle Insert? ____ yes X no

II. Chipped Nozzle Insert? ____ yes X no

If Yes:

| Condition (I or II) | Degree Location (Deg.) | Axial Length (In.) | Circumferential Width (In.) | Degree Arc |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Notes / Comments

cracks in the char layer. NO apparent damage to the insert.

MORTON THIOKOL INC.
Wasatch Operations

Table D-III

Ignition System Sealing Surface Condition - Evaluation Checkoff Worksheet

Inspector(s): P McCluskey

Motor No.: QM-6 | Date: 5-16-85

Joint: ☐ S&A to Adapter ☒ Adapter to Case ☐ Adapter to Chamber

A. Rust on Metal Parts (Corrosion)? X yes ___ no

B. Metal Damage? ___ yes X no

Clarify below or on a OCF, if necessary

C. Heat Affected or Sooted? X yes ___ no

If any of the above conditions exist, record affected part (adapter, chamber, dome or S&A) and the indicated data below:

| Condition Indicate with: A, B or C | Affected Part | Degree Location (Deg.) | Radial Distance (In.) | Degree Arc | Circumferential Width (In.) |
|---|---|---|---|---|---|
| A | Adapter | 0-30° | | | |
| C | Chamber | 120°-40° | | 300° | |
| | | | | | |
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Notes / Comments

A) light rust on adapter sealing surface. No heat affect

C) Soot on chamber from putty blow hole at 335°
No heat affected areas.